

LABORATORY AND FIRE SAFETY TRAINING

Environmental Health & Safety
University of Massachusetts, Amherst
2012

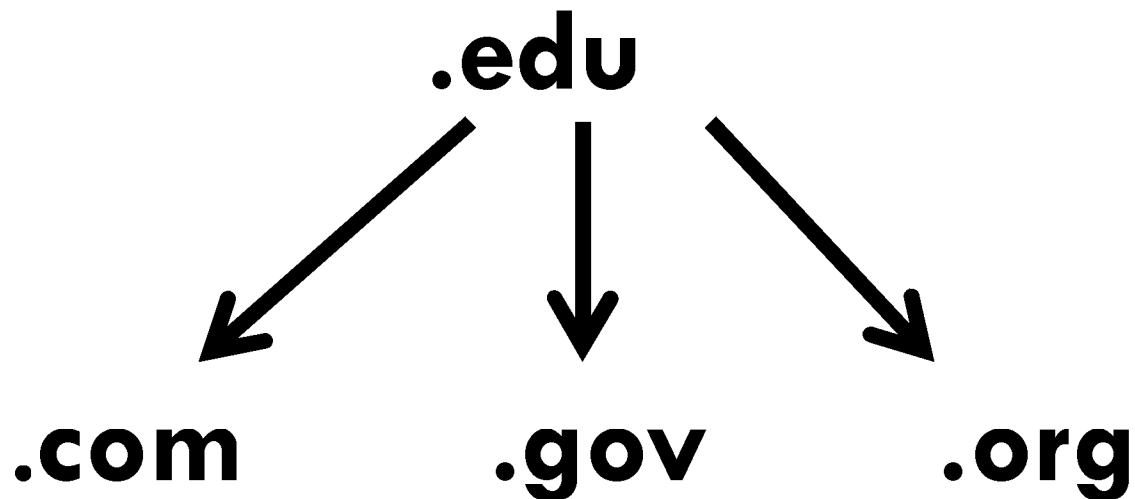
Training – Why?

The University, supervisors, and individuals are all responsible for providing a safe work environment

Training is a tool to help accomplish this

The University must be compliant with regulatory agencies regarding safety

Training – Why?



**Safety habits formed now will be
with you your entire working life**

Reduce the risks

- 1. Engineering Controls –
fume hoods, biosafety cabinets,
glove boxes, gas cabinets, room
ventilation**
- 2. Work Practices**
- 3. Administrative Controls –Training; rules;
SOPs, enforcement**
- 4. Personal Protective Equipment (PPE)**

Preparation

- ❑ **Review all procedures for the experimental protocol**
- ❑ **Know the hazards and assess the risks**
- ❑ **Post Material Safety Data Sheets (MSDS) or create a desktop link for easy access**
- ❑ **Know your safety equipment**

Preparation (cont.)

- ❑ **Know what to do in case of an emergency**
- ❑ **Practice good housekeeping**
- ❑ **Wear appropriate Personal Protective Equipment (PPE)**
- ❑ **Work in a chemical hood with hazardous chemicals**

Individual Lab Health and Safety Plan

- ❑ **Safety Procedures**
- ❑ **Experimental Protocols**
- ❑ **Information on:**
 - ❑ **Safety Equipment**
 - ❑ **PPE**
 - ❑ **Ventilation**
 - ❑ **Handling of Chemicals**
- ❑ **Responsibilities of Department Heads, Professors, Staff, and Students**

Life Safety Devices

Know the location of:

- ☐ **Nearest exit - not necessarily the one you routinely use**
- ☐ **Emergency shutoffs**
- ☐ **Fire extinguisher**
- ☐ **Fire alarm pull station**
- ☐ **Eyewash station**
- ☐ **Safety shower**
- ☐ **Phone**

Designate a meeting place outside of the building during an emergency or evacuation for accountability of lab members

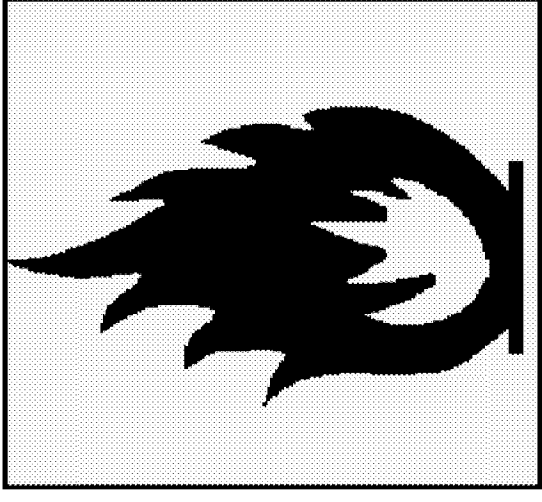
Emergency, Accident or Spill

- ❑ Alert all persons nearby
- ❑ Evacuate the area and close the door
- ❑ Contact Environmental Health and Safety (EH&S) at 5-2682, or
- ❑ Call 911 after 5 pm or on weekends
- ❑ On a cell phone: say **UMASS/AMHERST**

Ambulance Paramedics and University Health Services staff will want to see the MSDS

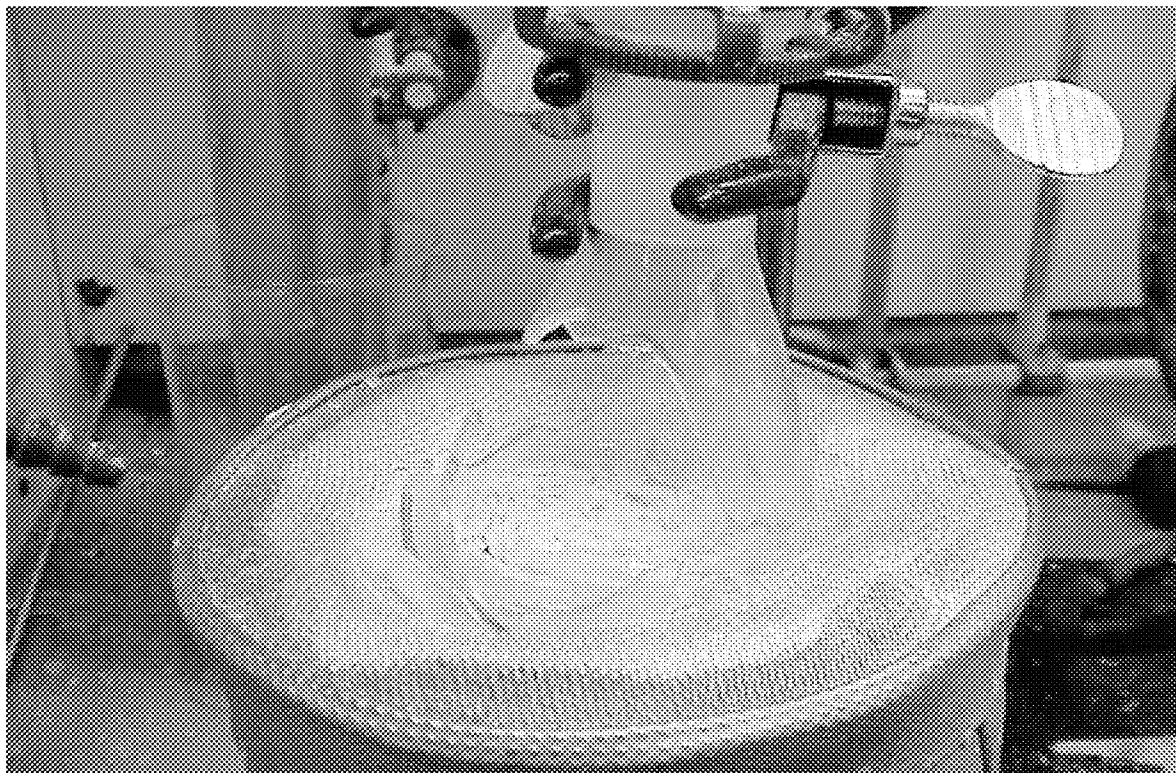
Explosions / Fire

- ❑ **Notify occupants in the immediate area**
- ❑ **Leave the area (remove injured persons if possible) and close the door**
- ❑ **Activate the building fire alarm**



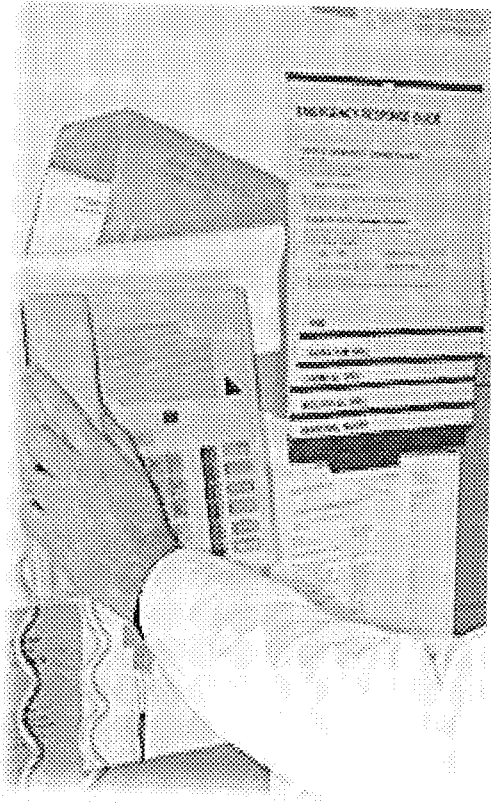
Call 911 (on cell: UMass/Amherst from a safe location)

Fire/Explosion Incident



Explosion from an ether reaction

Accidents and Injuries



- ❑ **Chemical Exposure - Use eyewash or drench shower to flush area for at least 15 minutes**
- ❑ **Call 911 for all serious injuries and request and ambulance**
- ❑ **For minor injuries, call EH&S at 5-2682 to report the incident AND go to University Health Services Urgent Care (577-5000).**
- ❑ **If you are an employee of the university, fill out a Notice of injury(NOI) form for human resources & EHS within 48 hours**

Examples of Emergencies

- ❑ **Thermal, cryogenic, or chemical burns**
- ❑ **Cuts, punctures wounds from contaminated glass or metal**
- ❑ **Chemical exposures such as skin or eye contact**
- ❑ **Chemical inhalation or ingestion**
- ❑ **Vapors that irritate eyes**

University of Massachusetts Amherst EMERGENCY ACTION PLAN

Campus Emergency **DIAL 911**, if from a cell phone say “Umass Amherst”
Environmental Health and Safety (EH&S)-----413.545.2682
UMass Police Department-----413.545.2121
University Health Services-----413.577.5000
Physical Plant-----413.545.0600

FIRE / EXPLOSION

- Notify occupants in the immediate area
- Leave the area (if possible, remove all injured victims) and close the door
- Pull the Building Fire Alarm located near the exit**
- Call **911** from a safe location
- Use a fire extinguisher Only if safe to do so; if the fire is small, you have had fire extinguisher training and the building fire alarm system has been activated.

CHEMICAL / BIOLOGICAL SPILL

- Notify occupants in the immediate area to evacuate
- Leave the area (if possible, remove all injured victims) and close the door
- Call EH&S at 413.545.2682 or the Campus Emergency Number **911**
Give the operator/dispatcher the following information:
 - Exact Location (room and building)
 - Brief description of incident (i.e. fire, potential problems, injuries/status of victims)
 - Chemical name, if known
 - Your intended location and phone number, away from the area of spill

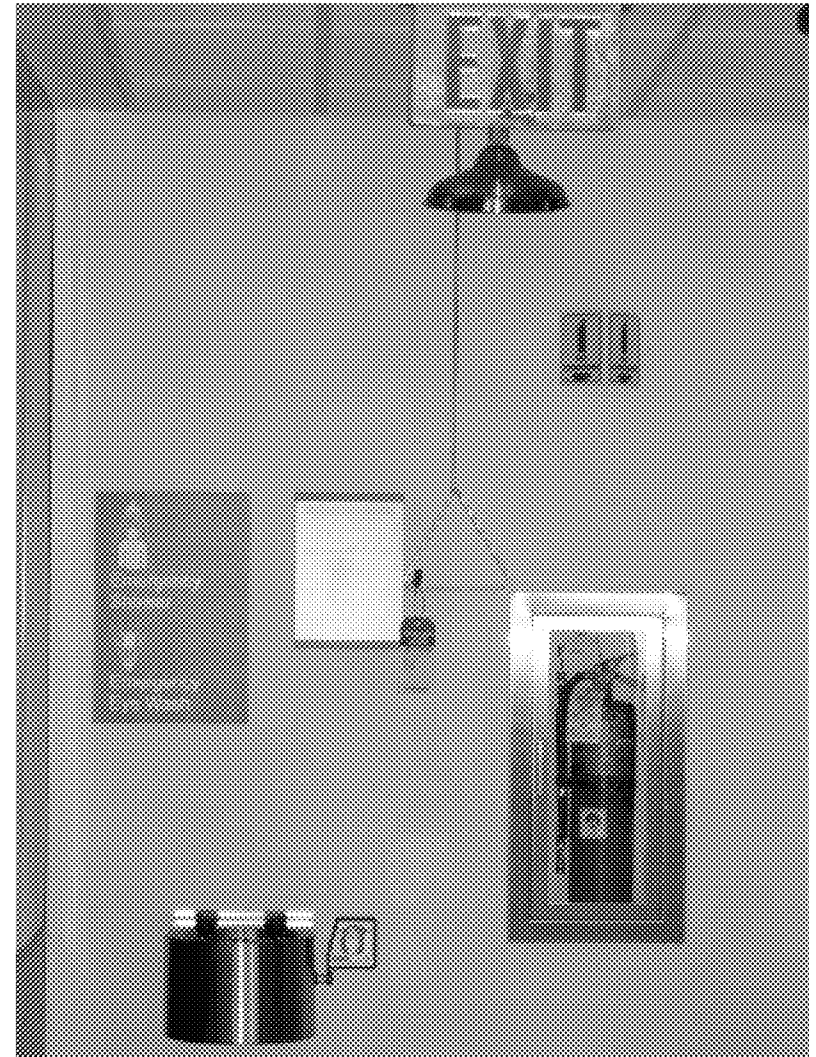
INJURIES

Seek medical treatment. The most important thing to do if you have a work-related injury or illness is to seek appropriate medical treatment. If you receive an injury that needs immediate advanced care, call 911 to summon an ambulance and emergency response personnel for care
etc

Emergency Response Equipment

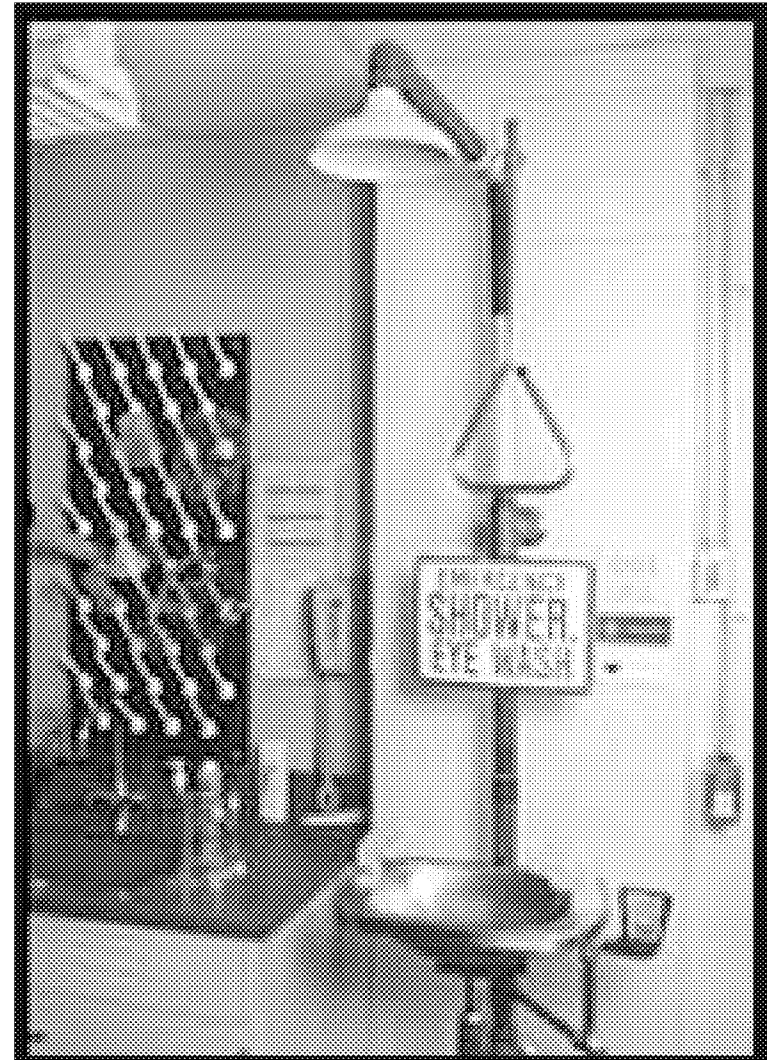
- ☐ **Drench Shower**
- ☐ **Eye Wash Station**
- ☐ **Fire Extinguisher**
- ☐ **First Aid Kit**
- ☐ **No ointment**

*Except Calcium Gluconate
when using Hydrofluoric acid*



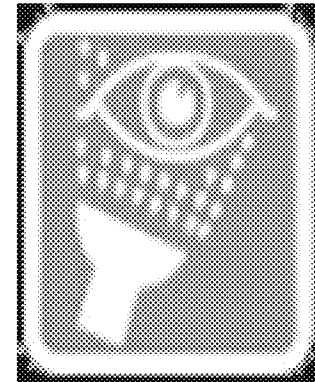
Emergency showers/eyewashes

- ❑ **Must not be blocked**
- ❑ **Must be accessible in 10 seconds**
- ❑ **Flush eyewash stations weekly and record**

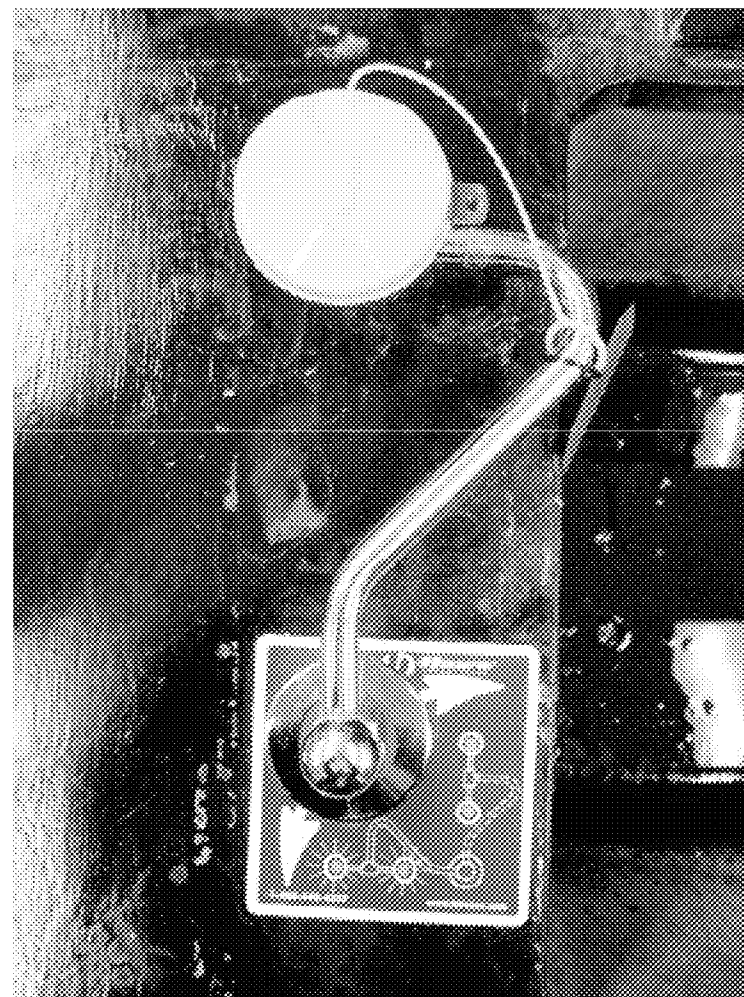


Emergency showers/eyewashes

- ❑ **Must be clearly marked with signs**
- ❑ **Eyewashes must be run *at least 15 minutes* with eyes held open**



Emergency showers/eyewashes



**Expect different types
of eyewash stations
throughout the laboratories**

RESOURCES



First aid kit, phone, MSDS, emergency information

Massachusetts Right to Know (RTK)

- ❑ A law for public employees in Massachusetts
- ❑ Mirrors the Federal Occupational Safety and Health Administration (OSHA) Hazard Communication regulation that covers private industries
- ❑ RTK requires information (e.g., MSDS) on hazardous substances be distributed to employees and students working in labs

MSDS Requirements

- ❑ **Chemical Name**
- ❑ **Hazards**
- ❑ **Precautions**
- ❑ **Emergency Procedures**
- ❑ **Health Hazard Risks**
- ❑ **Date MSDS was prepared**

MSDS includes

- 1. Product Identity*
- 2. Hazardous Ingredients*
- 3. Physical Data*
- 4. Fire & Explosion Data*
- 5. Reactivity Data*
- 6. Health Hazard Data*
- 7. Precautions for Handling*
- 8. Control Measures*

Information in MSDS

- ❑ **Permissible Exposure Limit (PEL)**
- ❑ **Threshold Limit Value (TLV)**
- ❑ **Time Weighted Average (TWA)**
- ❑ **Lethal Dose 50 - LD₅₀** is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals. The LD₅₀ is one way to measure the short-term poisoning potential (acute toxicity) of a material

Where to Obtain an MSDS

- ❑ **EH&S Web Site – www.ehs.umass.edu**
- ❑ **Links to MSDS sites**
- ❑ **Directly from Company supplying chemical**
- ❑ **From CEMS website**
<http://www.umass.cems.sr.unh.edu>

CEMS

- ☐ **Maintains an inventory of all chemicals on the UMass campus**
- ☐ **EH&S receives all chemicals in LGRT 125 and delivers chemicals to all labs**
- ☐ **Barcode system is used to remove discarded containers from inventory**
- ☐ **For questions regarding CEMS Program contact Glenda Pons gpons@ehs.umass.edu**

CEMS Program

Maintains and posts signage for all laboratory doors for correct identification of occupants and hazards

CEMS Door Sign

LABORATORY SAFETY INFORMATION

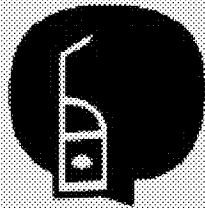
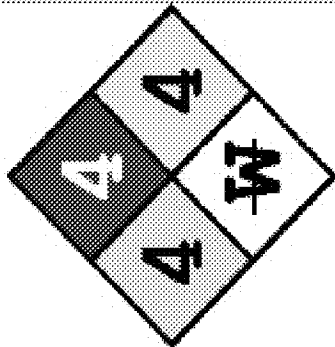
Campus Emergency Number (Ambulance/Fire/Police) 911

Environmental Health & Safety Physical Plant University Health Services

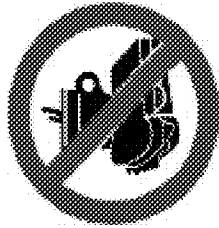
545-2682

545-0400

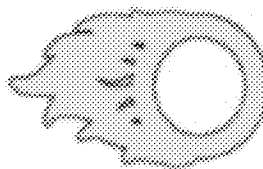
577-5900



EYE
PROTECTION
REQUIRED



NO EATING OR
DRINKING



OXIDIZER



COMPRESSED
GAS

Location: Cora Polymer Research Center B311

Last Updated On: 2010-01-20

Additional Information:

Special Instructions:

Spill Kit Location:

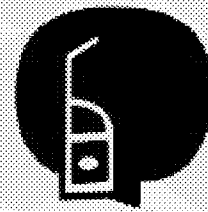
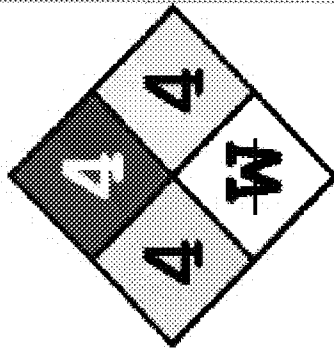
Emergency Contact	Department	Title	Office Phone	Home Phone
James W. Rubin	Polymer Science and Engineering	Principal Investigator	545-2569	513-1210
Harry Benmiller	Polymer Science and Engineering	Senior Coordinator	577-1415	413-235-3314
Thomas Mirman	Polymer Science and Engineering	Lab Coordinator	5-9885	513-235-3559
Eric Anderson	Polymer Science and Engineering	Grad Student		847-431-1815
Chris Diegler	Polymer Science and Engineering	Grad Student		413-235-0480
Munir Wang	Polymer Science and Engineering	Grad Student		413-935-1502

<http://www.umass.edu/CEMS/Signs/14-1234/93/2010/136-40.pdf>

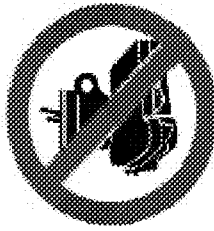
LABORATORY SAFETY INFORMATION

Campus Emergency Number (Ambulance/Fire/Police) 911

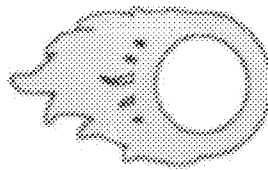
Environmental Health & Safety 543-2682 Physical Plant 543-0400 University Health Services 577-5000



EYE PROTECTION REQUIRED



NO EATING OR DRINKING



OXIDIZER

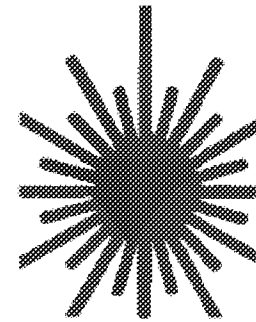


COMPRESSED GAS

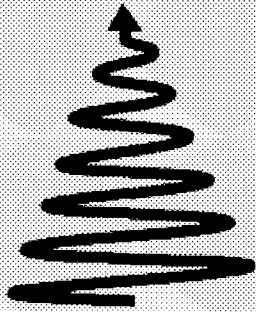
Additional Hazards



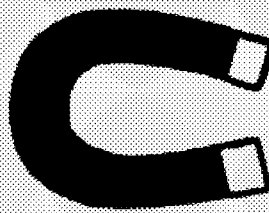
Location: Conte Polymer Research Center B311		Last Updated On: 2010-01-20		
Additional Information:				
Special Instructions:				
Spill Kit Location:				
Emergency Contact	Department	Title	Office Phone	Home Phone
James Watkins	Polymer Science and Engineering	Principal Investigator	543-2369	513-1116
Henry Hernandez	Polymer Science and Engineering	Safety Coordinator	577-1415	513-190-5814
Emilio Miranda	Polymer Science and Engineering	Lab Coordinator	5-9655	513-839-3634
Eric Anderson	Polymer Science and Engineering	Grad Student		847-121-1815
Chris Ziegler	Polymer Science and Engineering	Grad Student		513-236-0483
Xiaoyi Wang	Polymer Science and Engineering	Grad Student		513-236-1561



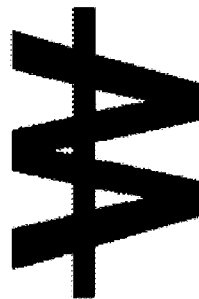
CAUTION LASER



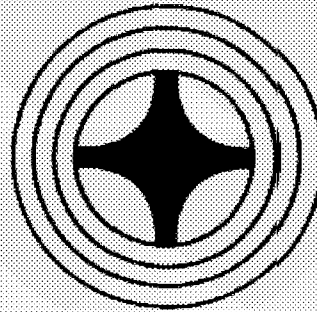
ULTRA VIOLET LIGHT



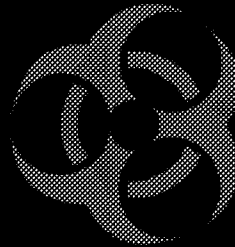
STRONG MAGNETIC FIELD



WATER REACTIVE



MICROWAVE RADIATION



INFECTIOUS AGENT BSL-2

Chemical Hazards

Four types of chemical hazards:

- ❑ ***Flammable Liquids or Solids***
- ❑ ***Corrosives: PH<2 and >12.5***
- ❑ ***Reactives***
- ❑ ***Toxic or Poison***

Chemical Hazard

Flammable Liquids



- ☐ OSHA definition, a flammable liquid has a flashpoint below 100°F (37.8°C)
- ☐ Never use an open flame to heat flammable liquids.
- ☐ Work with Flammable liquids *only in chemical hoods.*
- ☐ Store in flammable storage cabinet or flammable storage refrigerators
- ☐ Peroxides formers: Diethyl Ether, Tetrahydrofuran (THF), p Dioxane, Divinylacetylene: date the container when opened and check for peroxides often.

Flammable Storage Cabinet



Chemical Hazards

Combustible Liquids



- ❑ **OSHA definition: a combustible liquid has a flashpoint at or above 100°F (37.8°C) but below 200°F, except any mixture having components with flashpoints of 200°F or higher.**
- ❑ **Irritant to the skin and breathing**
- ❑ **Examples: turpentine, fuel oil**

Chemical Hazards

Flammable Solids



- ❑ OSHA definition: a solid, other than a blasting agent or explosive, that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing.
- ❑ Can be ignited readily and, when ignited, burns so vigorously and persistently as to create a serious hazard.
- ❑ Ex: sodium metal , lithium wire, nickel

Chemical Hazards

Corrosives



- ❑ OSHA definition: a chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the site of contact
- ❑ Breathing corrosive vapors or mists can cause severe bronchial irritation.
- ❑ Corrosive substances include: strong acids, strong bases (caustics), strong dehydrating agents, and strong oxidizers.
- ❑ $\text{PH} < 2$ and > 12.5 liquids are corrosive.

Chemical Hazard

Oxidizers



- ❑ OSHA definition: an oxidizer is a chemical that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases. Oxidizers are fire and explosion hazards on contact with organic materials and inorganic reducing agents.
- ❑ Strong oxidizing agents: concentrated nitric acid, concentrated sulfuric acid, nitrates, nitrites, perchloric acids, chromates, permanganates, sodium hypochlorite.
- ❑ *In the event of bodily contact with an oxidizer, the area exposed should be immediately flushed with large quantities of water for at least fifteen (15) minutes.*

Reactive Substances



- ❑ OSHA definition: a water-reactive chemical reacts with water to release a gas that is either flammable or presents a health hazard. Reactive substances are unstable when mixed with other substances and may cause fire, explosion, or the production of poisonous gases
- ❑ Reactive substances include: explosives, water reactives, cyanides & sulfides.
- ❑ *Use special PPE when working with Reactives*

Toxic Substances



- ❑ The degree of toxicity of different substances varies considerably as does the amount of time before symptoms are noticed.
- ❑ Toxic substances may enter the body through *skin contact, ingestion, or inhalation*.
- ❑ Wear appropriate personal protective equipment (PPE) and wash one's hands frequently and thoroughly when using toxic substances.

Chemical Hazards

Carcinogens (*C*)

- ❑ **Carcinogens have the potential, especially after repeated exposure, to produce benign and/or malignant (cancerous) tumors**
- ❑ **There is often a long period between exposure and the onset of the disease.**
- ❑ **Massachusetts Substance List: includes asbestos dust, benzene, carbon tetrachloride, formaldehyde and polychlorinated biphenyls (PCB's).**
- ❑ **International Agency for Research on Cancer
<http://www.iarc.fr/>**

Chemical Hazards

Mutagens

- ❑ Substances that cause genetic changes in cells and transmissible changes produced in offspring
- ❑ May produce miscarriages or children born with genetic birth defects
- ❑ Example: *Ethidium Bromide*

Chemical Hazards

Teratogens (*T*)

- ❑ **Substance or combination of substances for which valid scientific evidence shows that prenatal exposure may lead to: mortality, structural malformation, functional/behavioral defects, or growth retardation of the zygote, embryo, fetus, neonate, child, or adult**
- ❑ **Examples: chlorinated solvents, Pyridine**
- ❑ **If you are pregnant or plan to be, you should consult with your physician regarding use of teratogens**

Chemical Hazards

Neurotoxins (*N*)

- ❑ **Substances that are harmful to the nervous system including the brain, spinal cord, and nerves.**
- ❑ **Examples of neurotoxins from the MSL include: malathion, parathion, and carbaryl**
- ❑ **Examples: chloroform, ether.**

Extraordinarily Hazardous Substances (*E*)

- 105 CMR 670.005 defines an extraordinarily hazardous substance as a substance which is designated a carcinogen

[OR]

- that the substance has an *oral* LD₅₀ of 25 milligrams or less per kilogram in one or more species of test animals, or an LC₅₀ of 0.5 milligrams per liter in one or more species of test animals exposed for a period of up to eight hours

Chemical Compatibility

- ☐ **Group A- Acids, Inorganics**
- ☐ **Group B- Bases**
- ☐ **Group C- Organic chemicals**
- ☐ **Group D- Flammable and combustible organic liquids**
- ☐ **Group E- Inorganic oxidizers and salts**
- ☐ **Group F- Organic Peroxides and Explosives.**
- ☐ **Group G- Reactives**
- ☐ **Group H- Cyanides and sulfides**
- ☐ **Group I- Carcinogenic and highly toxic chemicals**

Labeling Hazardous Substances in the Workplace

- ❑ The chemical name **must** appear on containers of all hazardous substances including chemical constituents and hazards
- ❑ Mixtures must be *labeled*
- ❑ Additional identifiers help in the event of an emergency and/or when the lab is decommissioned
 - ❑ NFPA diamond, HMIS designations
 - ❑ Name of researcher, date, notebook number

NFPA diamond



Provides first responders (fire fighters) with a guide to the potential hazards in a laboratory

CEMS Door Sign

LABORATORY SAFETY INFORMATION

Campus Emergency Number (Ambulance/Fire/Police) 9111

Environmental Health & Safety Physical Plant

545-2682 545-0409

University Health Services 577-5900

EYE PROTECTION REQUIRED

NO EATING OR DRINKING

OXIDIZER

COMPRESSED GAS

Location: Core Polymer Research Center B311 Last Updated On: 2010-01-20

Additional Information:

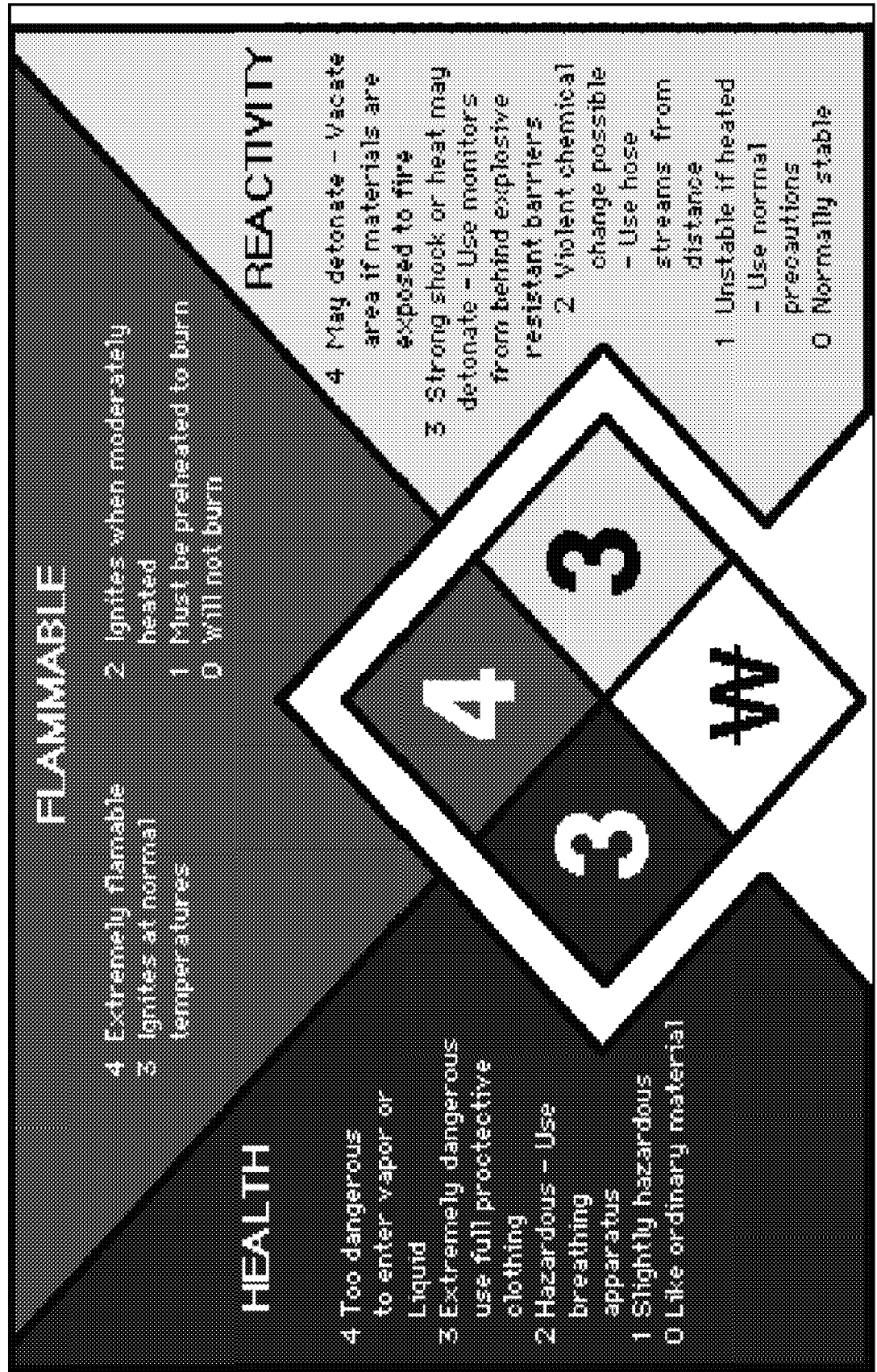
Special Instructions:

Spill Kit Location:

Emergency Contact	Department	Title	Office Phone	Home Phone
James W. Rubin	Polymer Science and Engineering	Principal Investigator	545-2569	533-1210
Henry Berninger	Polymer Science and Engineering	Senior Coordinator	577-1415	415-235-3314
Thomas Mirman	Polymer Science and Engineering	Lab Coordinator	545-2569	513-439-3559
Eric Anderson	Polymer Science and Engineering	Grad Student		847-431-1815
Chris Ziegler	Polymer Science and Engineering	Grad Student		415-235-0480
Maria Wang	Polymer Science and Engineering	Grad Student		415-935-1502

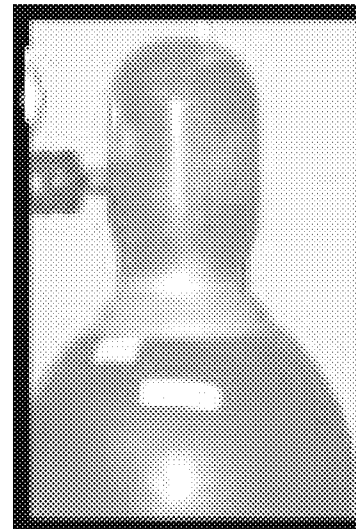
<http://www.chemsafety.com/cecms/Signs/714-1234/911%20106-40.pdf>

NFPA Diamond



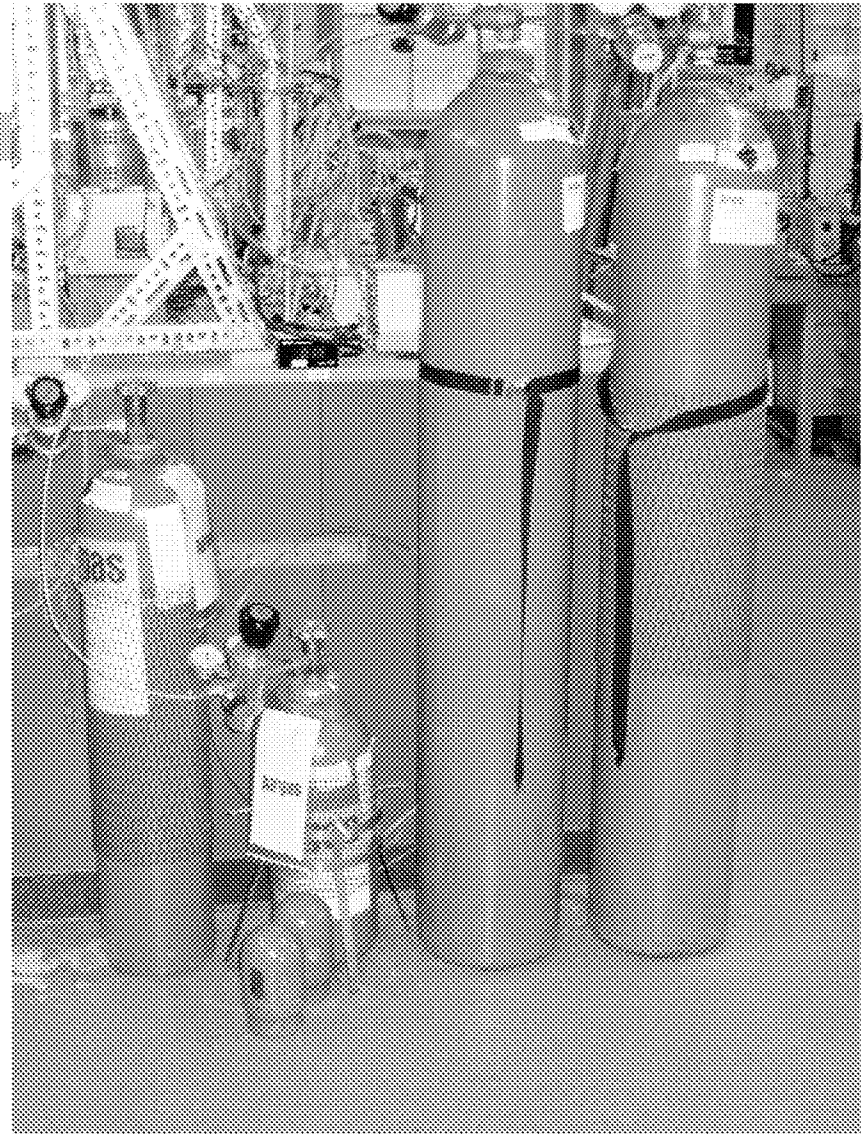
Gas cylinders

- ❑ ***Understand*** the danger of gas cylinders
- ❑ **Cylinders must be capped during transport and storage**
- ❑ ***Do not leave*** gas cylinders in corridors
- ❑ ***Monitor for leaks*** and label all cylinders: Full or “Empty”



Gas cylinders

- ❑ Cylinders must be securely fastened to an immovable object or table when in use



Inert Cryogenic Liquids

Liquid Nitrogen

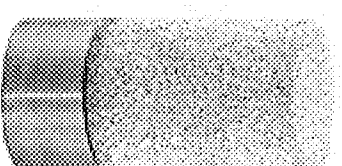
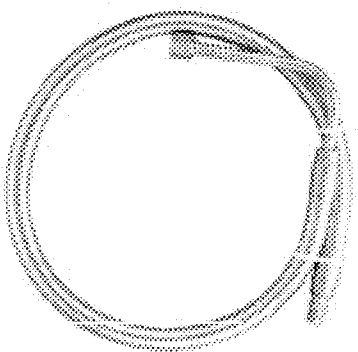
- ❑ ***Know* first aid procedures for frostbite before handling liquid nitrogen**
- ❑ ***Wear* eye protection, face shield, cryogenic gloves, lab coat or cryogenic apron, sturdy closed-toed shoes**
- ❑ ***Store* in well ventilated area.**
- ❑ ***Transport* in insulated Dewar only. Do not use a screw top container.**

Inert Cryogenic Liquids

Liquid Nitrogen



Cryogenic Accessories/PPE



Airgas
Safety

Biological Safety Levels (BSL)

- ❑ **BSL 1 - not known to consistently cause disease in normal healthy adults. Examples: E. coli (K12 strains), most recombinant DNA work (monitored by UMass Institutional Biosafety Committee), plant research labs, undergraduate teaching labs**
- ❑ **BSL-2 Moderate risk agents that cause human disease of varying severity by skin puncture, ingestion, mucus membrane exposure (splashes). Examples: Listeria, Salmonella, Staphylococcus aureus (MRSA, VRSA), Hepatitis A, B, C, Human Source material, HIV**
- ❑ **Biosafety training required annually for labs using BSL2 agents, recombinant DNA and/or human source materials such as blood, sputum, saliva and cell lines**
- ❑ **Contact Judy LaDuc at jladuc@ehs.umass.edu, 413.545.2682**

Aerosol

A suspension of liquid droplets or small ($< 5\mu\text{m}$) particles in the air that may remain suspended in air for long periods and may travel long distances.

Aerosol transmission occurs when particles containing a biological agent are inhaled by another person. Aerosols are typically generated by coughing but may be caused by:

Common lab procedures-

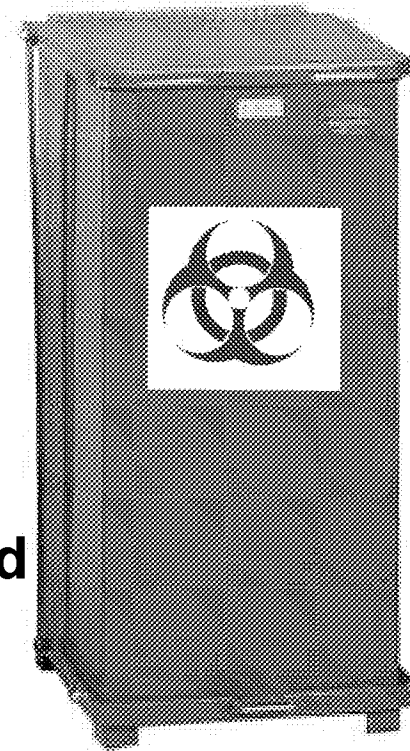
- ✓ Vigorous shaking
- ✓ Pouring, Spraying
- ✓ Opening lyophilized cultures
- ✓ Flaming loops/needles
- ✓ Changing animal bedding

Use of a-

- ✓ Centrifuge
- ✓ Vortex
- ✓ Blender
- ✓ Homogenizer
- ✓ Sonicator

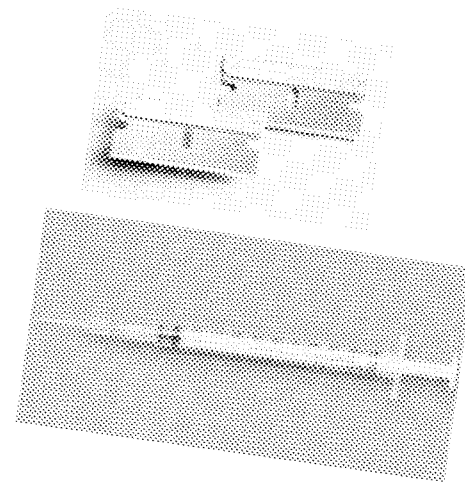
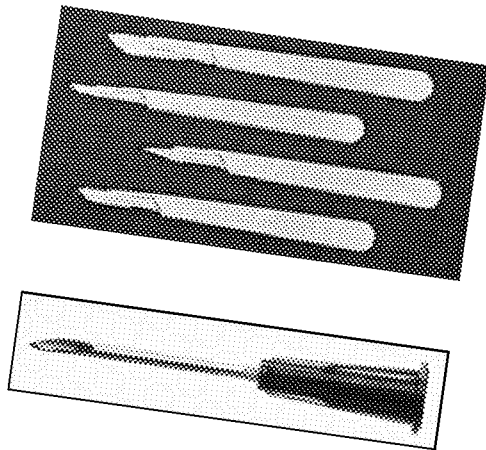
Biological Waste

- ☐ All biological waste must be kept in a leak proof and covered container labeled with a biohazard symbol
- ☐ The container must be lined with red plastic bags with a biohazard symbol
- ☐ All biological waste must be deactivated before disposal by incineration or autoclaving



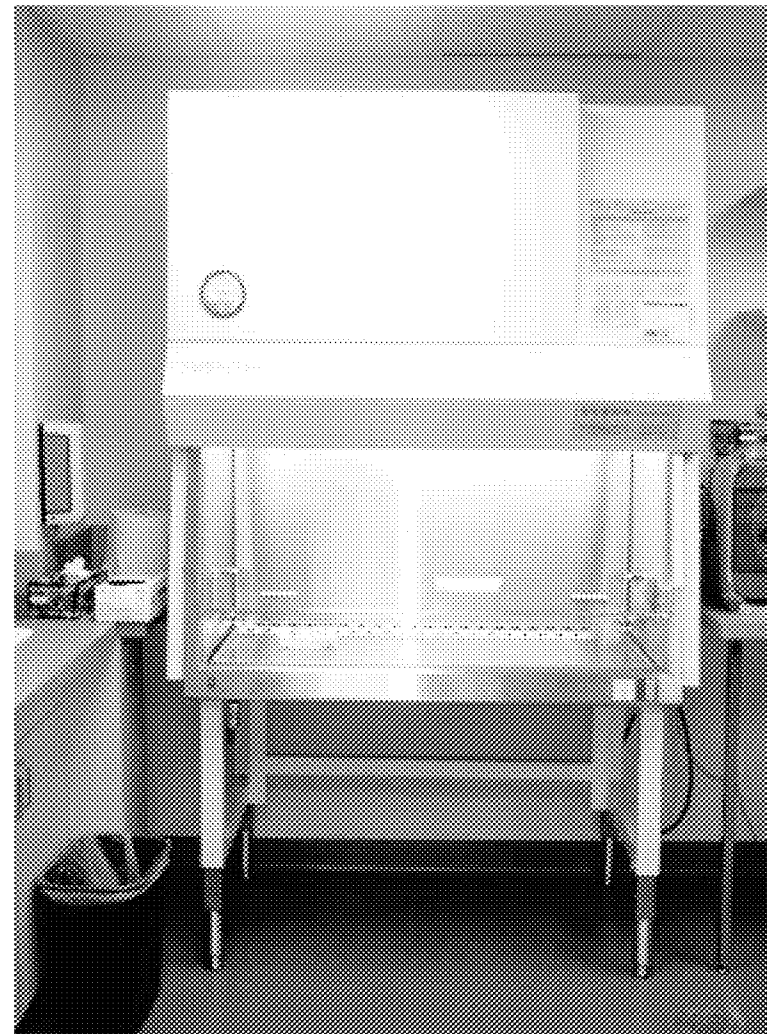
Sharps

- ❑ **Syringes, needles, razor blades, scalpel etc.**
- ❑ **Red Biohazard Puncture proof containers are free.**
Located in Fisher Stockroom, EH&S
- ❑ **Sharps containers are treated as medical waste and shipped out for incineration**
- ❑ **Must place a waste pick up request on EH&S website**



Biological Safety Cabinets Class II A2

- ☐ **Not for chemical use**
- ☐ **No flames**
- ☐ **Developed for working safely with biological materials**
- ☐ **HEPA filter = High Efficiency Particulate Air 99.97% min. particulate removal**



Laminar Flow Cabinets

- ☐ To keep product clean
- ☐ Does not protect user
- ☐ Not for chemical use!
- ☐ Tissue culture
- ☐ For clean room use



VAV Chemical (Fume) Hood

- ❑ **VAV HOOD:** Variable air volume systems are controlled by sensors that detect changes in air pressure or sash position to regulate the volume of air exhausted
- ❑ This type of hood maintains a constant air velocity at the hood face regardless of sash opening
- ❑ This type of hood saves energy - if the sash is not open, the air requirement into the hood is reduced



Constant Air Volume Hood

- ❑ **Constant air volume (CAV) hoods are designed to exhaust a constant air volume at all times**
- ❑ **This system will create higher air velocities through the sash opening - if the sash is lowered the air velocity into the hood increases**



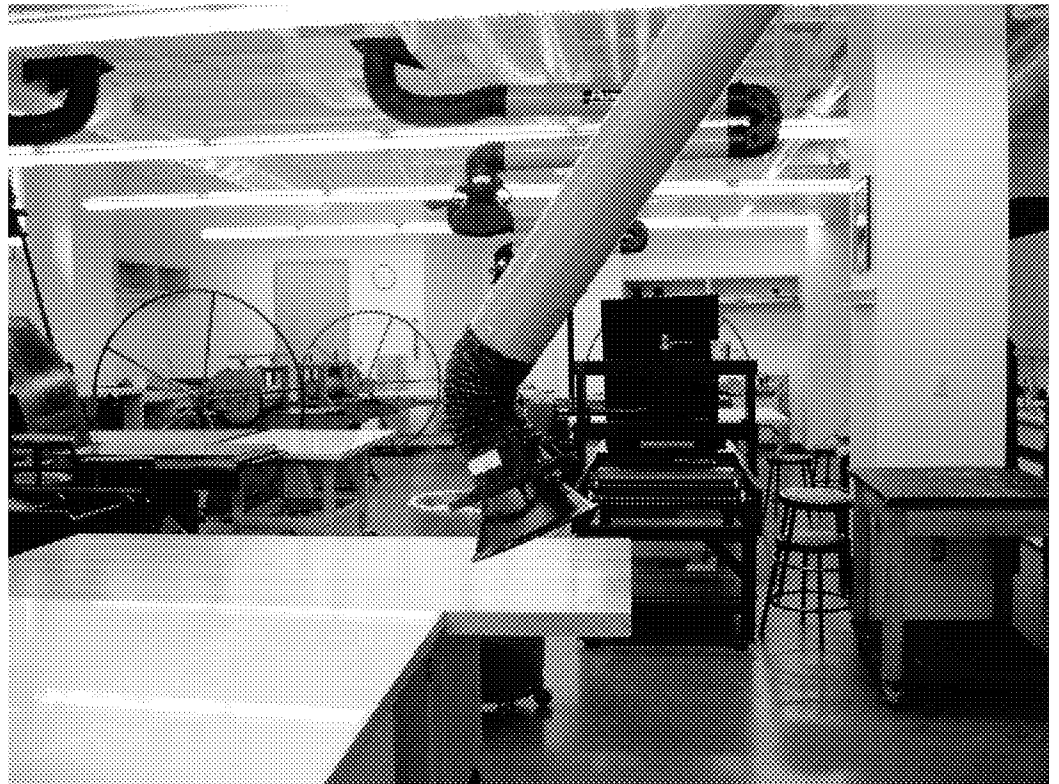
By-Pass Hood

- ❑ **BY-PASS HOOD:** This type of hood has a by-pass opening above the sash that maintains some air flow into the hood even when the sash is closed



Snorkel or Elephant Trunk Hood

- ❑ A piece of flexible duct or hose is connected to an exhaust system
- ❑ Intake must be close to the source point to be effective
- ❑ Do not put yourself in between the snorkel and the hazardous material



Proper Use of Chemical (Fume) Hoods

- ❑ Check air flow monitor before using hood
- ❑ Work *6 inches back* from hood face to prevent turbulence
- ❑ Place bottom of hood sash at *green marker* or lower
- ❑ Do not store chemicals or apparatus in the hood.
- ❑ Keep hoods uncluttered.

Chemical Hoods

- **Report any malfunctioning hood to EH&S 413.545.2682 or Physical Plant 413.545.0600**
- **Do not use hoods which are “Out of Service”**
- ***Energy conservation:* Close fume hood sash when not in use.**

Emergency room and hood purge

Know the location of emergency purge buttons

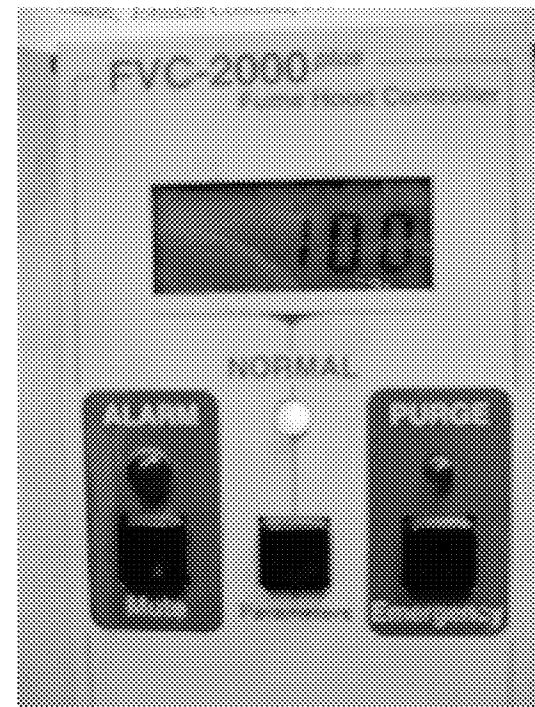
Room Purge

For spills inside the room



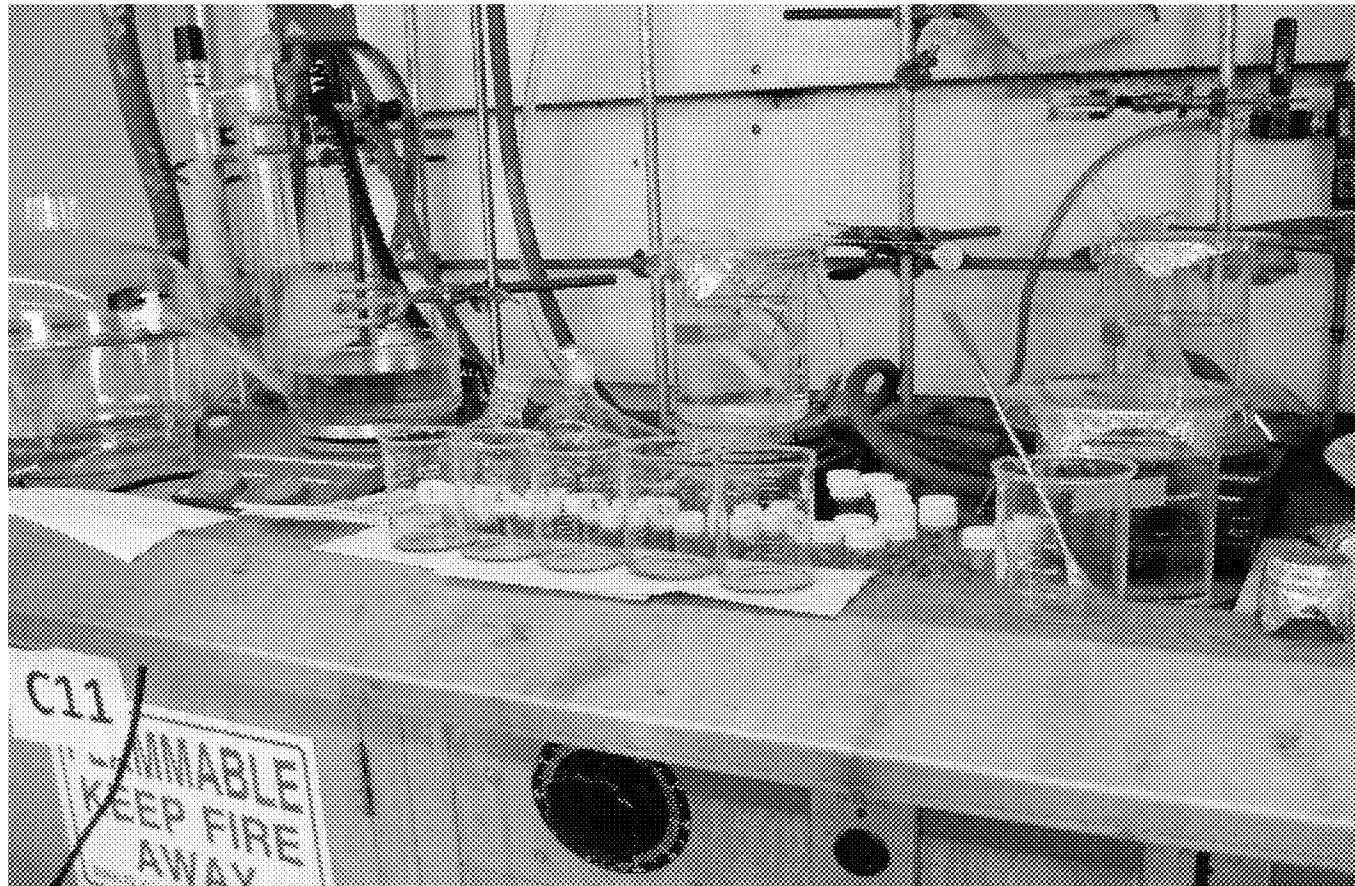
Chemical Hood Purge

For spills inside the chemical hood



Improper Use of Chemical Hood

Work 6 inches back from hood face. Label all materials



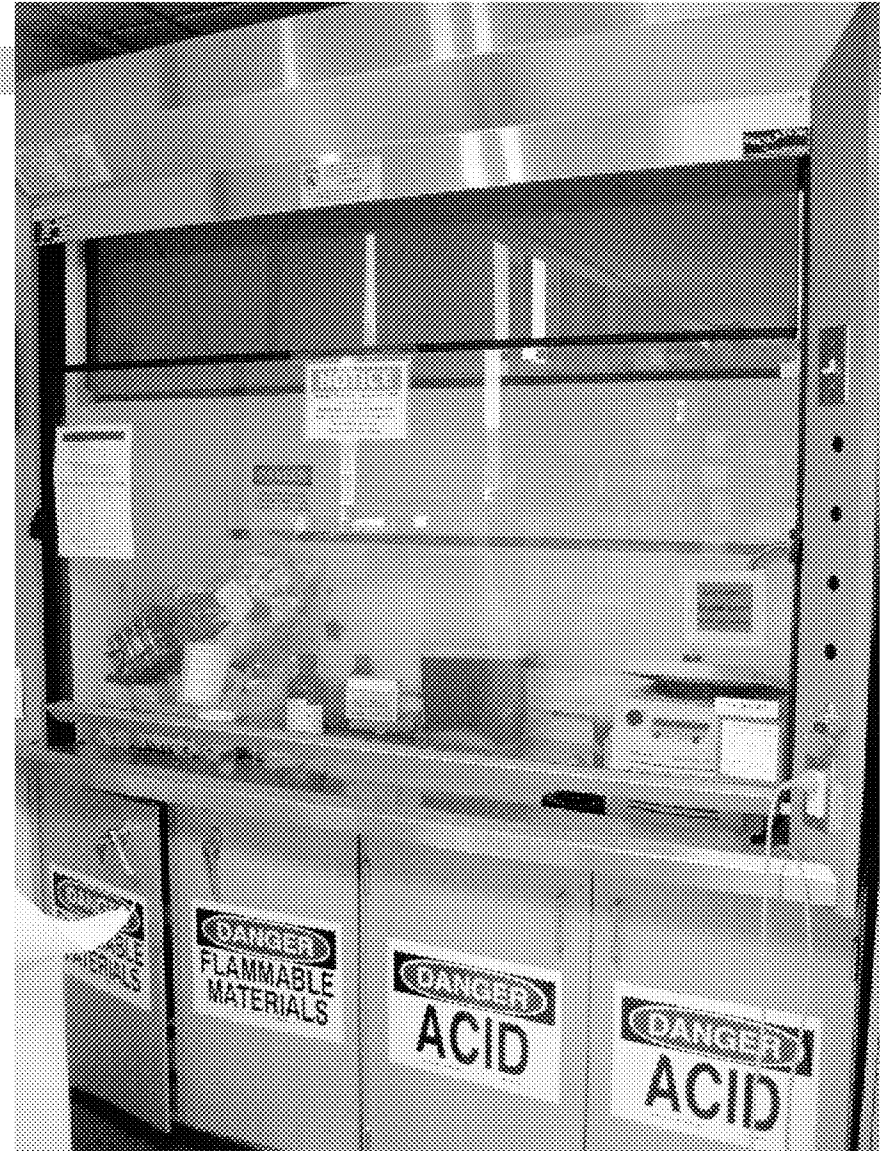
Improper Use of Chemical Hood

Chemical hood working surface is too crowded

Air flow is blocked

Flammable material cabinet is open

Hazardous waste bin is overflowing



What Procedures Require Prior Approval?

- ❑ **Operations involving:**
 - ❑ **Known carcinogens**
 - ❑ **Highly toxic gases with TLV-TWA of < 10 ppm**
 - ❑ **Processes causing extreme pressures**
 - ❑ **Chemicals of high chronic or acute toxicity**

A Risk Assessment of the procedure must be done

UCLA Incident December 2008

- ☐ **Resulted in a fatality**
- ☐ **Cal/OSHA said the lack of a lab coat was the single most significant factor in the severity of the burns that led to the researchers death**
- ☐ **Professor being prosecuted for felony negligence**

Yale Fatality April 2011

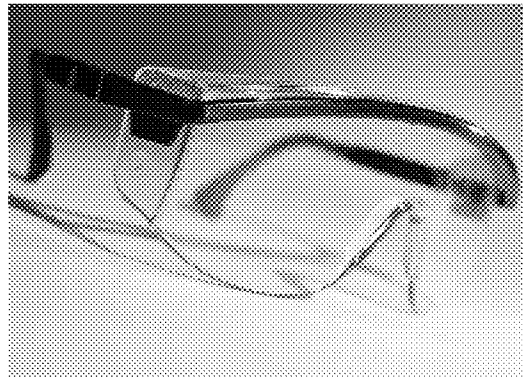
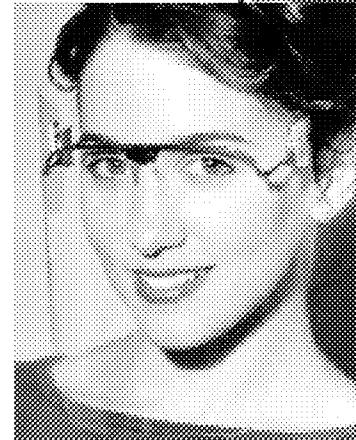
- ☐ **Working with lathe in Chemistry Dept. machine shop**
- ☐ **Researchers hair got caught in the spindle**
- ☐ **Cause of death was “accidental asphyxiation by neck compression”**
- ☐ **The single most significant factor in the severity of the accident was that the researcher was working alone**
- ☐ **Researcher could not reach “kill” switch as her hair was wrapping around the spindle**

Reduce the risks

1. Engineering Controls –
fume hoods, biosafety cabinets,
glove boxes, gas cabinets, room
ventilation
2. Work Practices
3. Administrative Controls – Training; rules;
SOPs, enforcement
4. **Personal Protective Equipment (PPE)**

Eye and Face protection

- ❑ ***Safety glasses*** should have Z-87.1 designation
- ❑ ***Safety goggles and splash face shield*** also with z-87.1
- ❑ ***Prescription glasses*** need ***OTG safety glasses***.



PPE: Ultraviolet (UV) Light

Overexposure to UV light can cause:

Corneal burn

Gritty feeling in eye

Sunburn to face



**UV rated face shield
(Lexan or orange tint)**

Devices that emit UV light:

Transilluminator

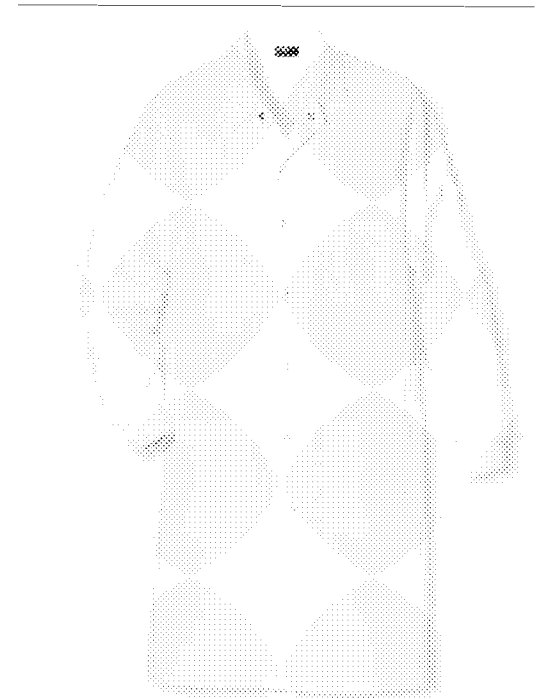
Crosslinker

Biosafety cabinets

- **ANSI Z78.1 does NOT mean UV proof, only shatterproof**
- **Glass in hoods or biosafety cabinets may not be UV proof**

PPE: Lab coat

- ❑ **Lab coat: long**
- ❑ **Ideally should be made with snaps/fasteners which afford the wearer quick removal in the event of an emergency**
- ❑ **Common materials (based on hazard)**
 - Cotton**
 - Polyester**
 - Polypropylene**
 - Flame resistant vs flame retardant**



Flame Resistant vs. Flame Retardant Material

- ❑ **Flame resistant** - the actual structure of the fiber itself is not flammable, which means the protection is permanent.
- ❑ **Nomex® brand protective apparel is inherently flame resistant.**

- ❑ **Flame retardant** - 100% cotton fabric treated to self-extinguish when removed from flame or ignition source.
- ❑ **Bulwark ® brand protective apparel is designed to be flame retardant**

PPE: Gloves

- ❑ **Choose gloves depending on chemicals used** Gloves should be selected on the basis of the material being handled and the particular hazard involved.
- ❑ **Consult permeation chart:** www.ehs.umass.edu
- ❑ **Gloves *must be removed* when leaving the labs**
- ❑ **Wash hands as soon as possible after removing protective gloves**
- ❑ **<http://www.osha.gov/Publications/osh3151.html>**

PPE Protective Gloves

- ❑ **Nitrile gloves**
 - ❑ **No protein allergens**
 - ❑ **Good antistatic behavior**
 - ❑ **Good chemical resistance**
 - ❑ **High puncture resistance**
 - ❑ **High flexibility**
 - ❑ **Solvent resistant**
- ❑ **Latex gloves**
 - ❑ **Contain protein allergens**
 - ❑ **Light protection against irritants**
 - ❑ **Limited protection against infectious agents**
 - ❑ **UMass Housing, food services, and custodial services are all latex free glove users**
 - ❑ **Latex gloves are not recommended for lab use.**

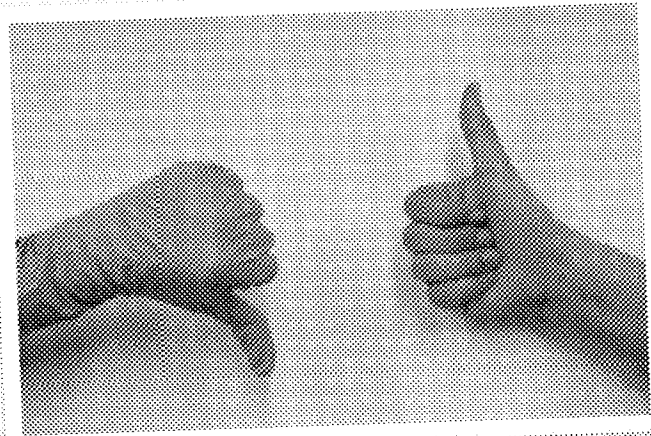
Protective Gloves

- ❑ **Natural Rubber** protects against mild corrosive material and electric shock.
- ❑ **Neoprene** for working with solvents, oils, or mild corrosive material.
- ❑ **PVC** protects against mild corrosives and irritants.
- ❑ **Cotton** absorbs perspiration, keeps objects clean, provides some limited fire retardant properties, no chemical resistance.
- ❑ **Zetex®** when handling small burning objects
- ❑ **Cryo** gloves for ultra cold environments

No gloves in hallways!

An Ode to Biochemical Safety

Not in the stairs, not in the hall,
Not outside the lab at all.
A glove must never touch a door,
Or push a button, *nevermore!*

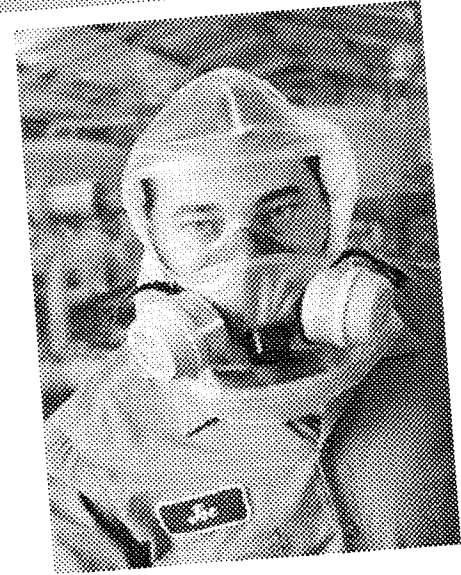


by Julie Goddard, Food Science

Thanks to hand models Fang and Fei

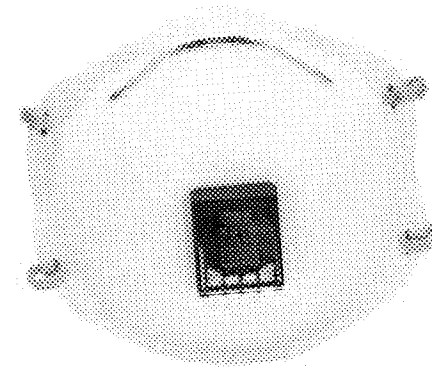
Respirators

**To wear a chemical respirator,
you must be part of the:
Respiratory Protection
Program, contact EHS 5-2682**

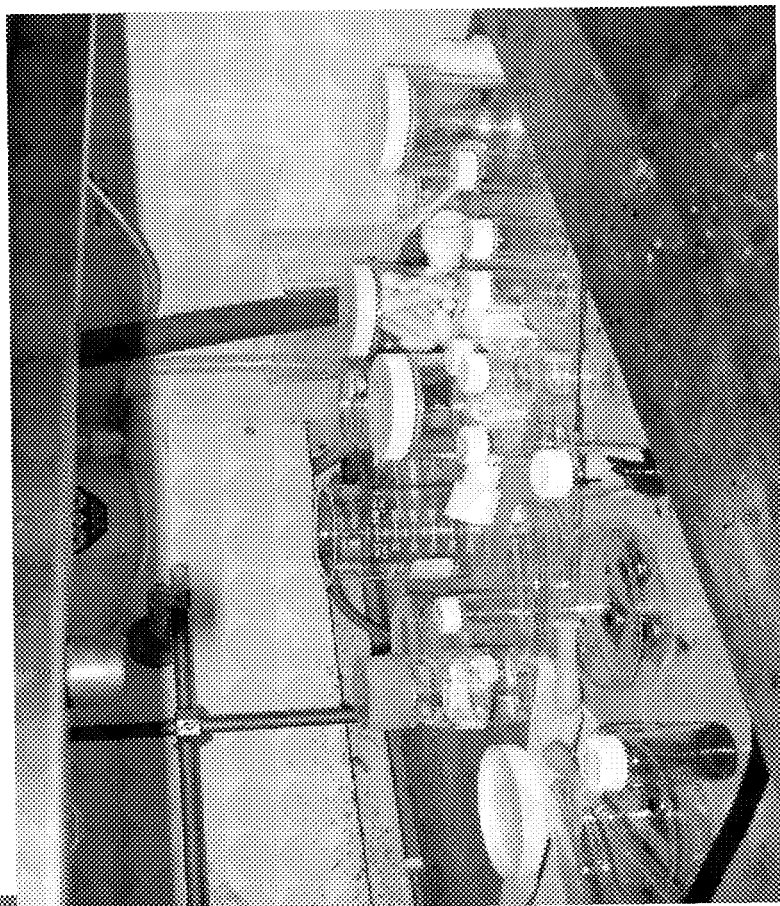


Requirements:

- ☐ **Medical evaluation (*may*
include a Pulmonary
Function Test)**
- ☐ **Fit test to wear a respirator**



Poor Housekeeping



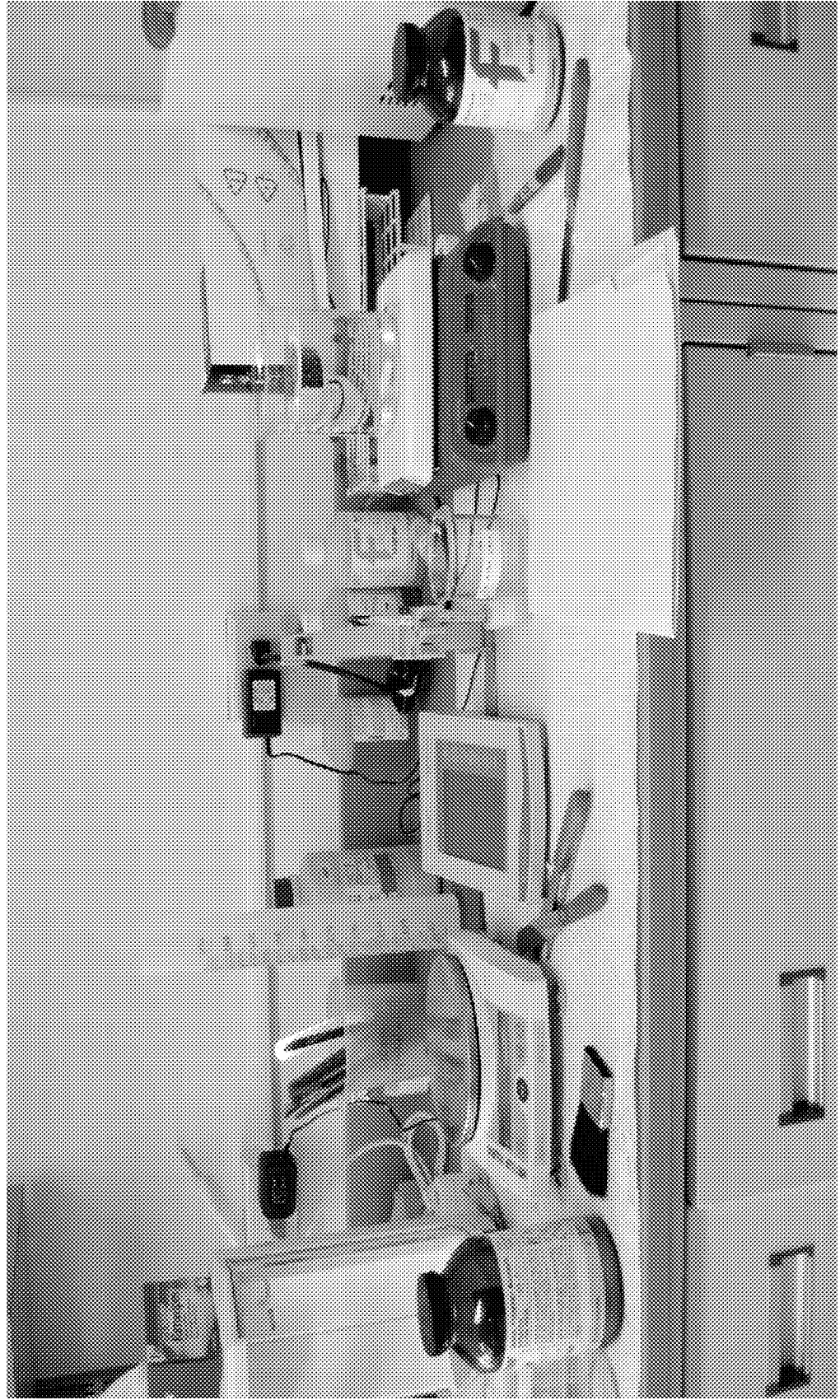
Poor Housekeeping



Poor Housekeeping



Good Housekeeping



Good Housekeeping



Good Housekeeping



Hand Washing



- ▶ **Single most important way to prevent infection and contamination**
- ▶ **Before and after:**
 - ✓ **Using gloves**
 - ✓ **Using restroom**
 - ✓ **Consuming food**
 - ✓ **Changing PPE**

No Food or Drink in the Laboratory

Protect Yourself

Hair should be tied back or secured so that it cannot become entangled in equipment or come in contact with a flame from a Bunsen burner

Cell phones and iPods™ (MP3 players) must not be used in the laboratory – ear infections

Wear closed toed shoes

No flip-flops, sandals or open-toed shoes

Protect yourself protect your skin

No shorts, skirts, sleeveless shirts etc

Questions on Lab Safety?

next

HAZARDOUS WASTE

Resource Conservation and Recovery Act – RCRA

- ❑ **Began in 1965 as the Solid Waste Disposal Act (SWDA)**
- ❑ **Major amendments in 1976 called Resource Conservation and Recovery Act (RCRA)**
- ❑ **Goals:**
 - ❑ **To protect human health and the environment from the potential hazards of waste disposal**
 - ❑ **To conserve energy and natural resources**
 - ❑ **To reduce the amount of waste generated, incl. hazardous waste**
 - ❑ **To ensure that wastes are managed in an environmentally sound manner**
- ❑ **Superfund Amendment Reauthorization Act (SARA)**
 - ❑ **Generator Responsible for their waste forever**

Hazardous Waste

The Town of Amherst has a Publicly Owned Treatment Work facility (POTW) that the University of Massachusetts uses. This POTW is in compliance with the Federal Clean Water Act and the Massachusetts Clean Waters Act.

Basically the federal and state government regulate and prohibit activities that compromise clean water.

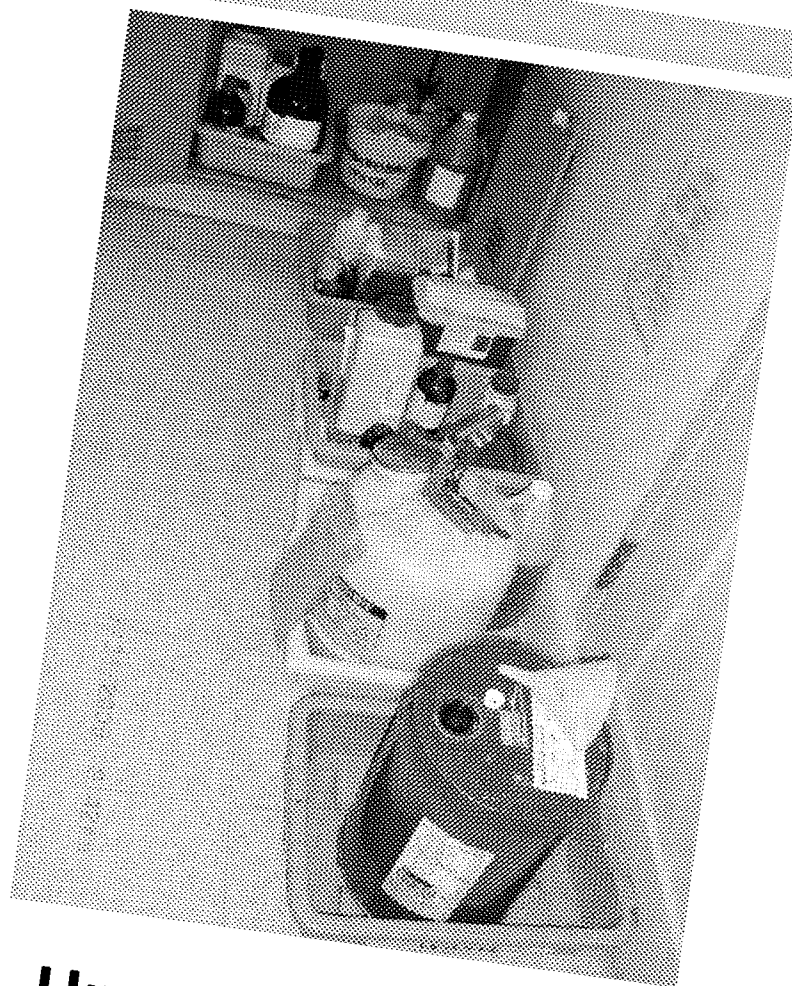
Do Not Dump Anything Down The Sink

Hazardous Waste

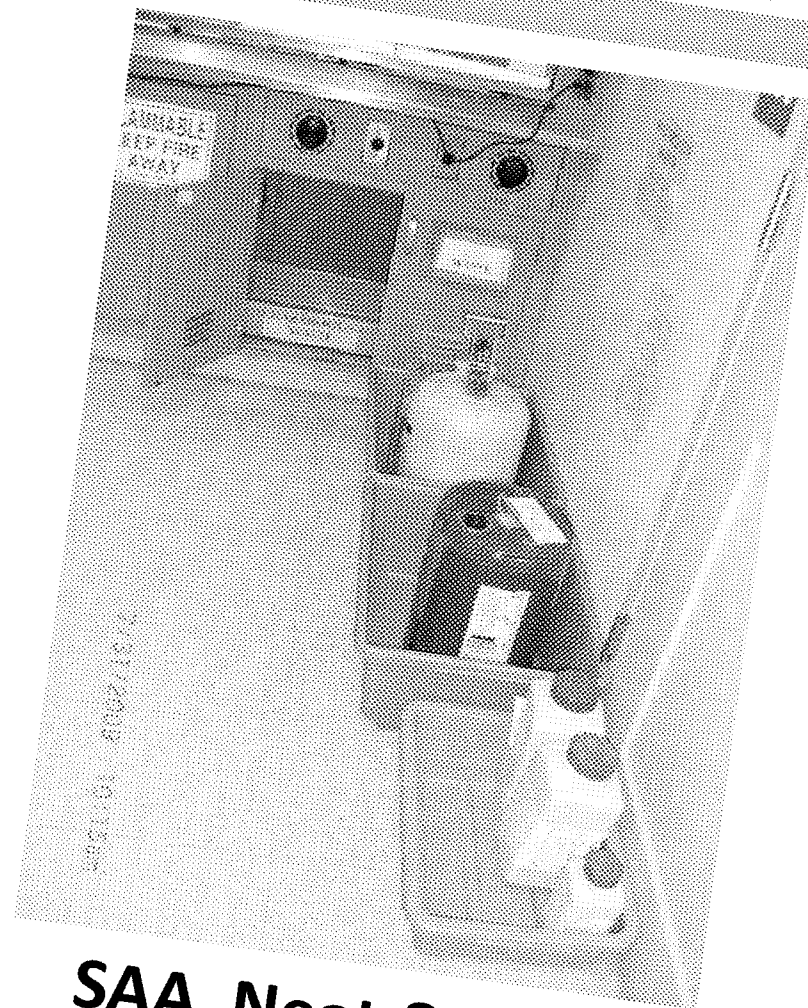
Satellite Accumulation Area (SAA)

- ❑ **The SAA must be located at or near the point of generation of the waste**

Satellite Accumulation Areas (SAA)



Unacceptable SAA

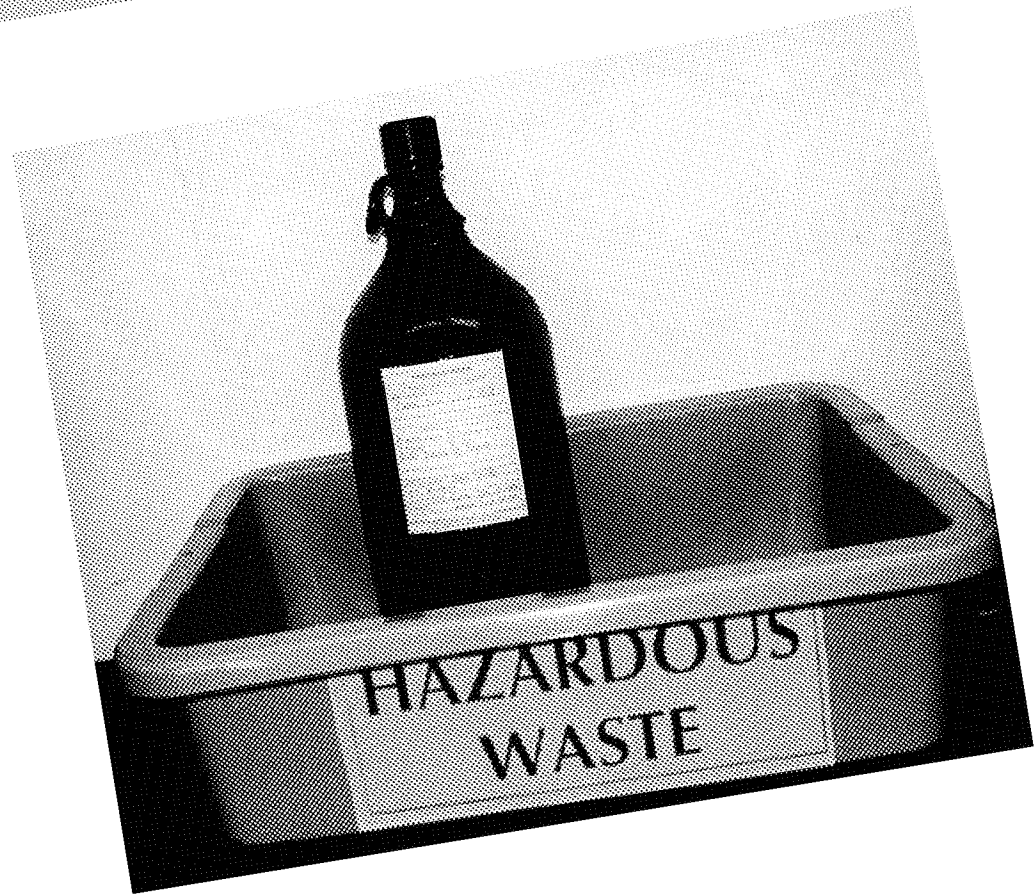


SAA Neat & Orderly

<h2 style="text-align: center;">Hazardous Waste</h2>	
<input type="checkbox"/> Accidental Spills (see also at "Comments")	
Waste Identity (as Specified): 4 liter methanol, 30%; acetone, 40%; hydrochloric acid, 2%; water, balance	
Hazard (Check all that apply): <input checked="" type="checkbox"/> Irritant (pH < 6.0) <input checked="" type="checkbox"/> Corrosive (pH < 1.0 or <input type="checkbox"/> Reactive <input checked="" type="checkbox"/> Toxic <input type="checkbox"/> Other _____	
<hr/>	
Generator's name: J. Reynolds	
Phone: 555555	
Location of waste: GR0999	
Comments:	
<hr/>	
Call EH&S at 5-2582 for Pickup	

Secondary Containment

**Check chemical
compatibility
before adding
waste to a
container**

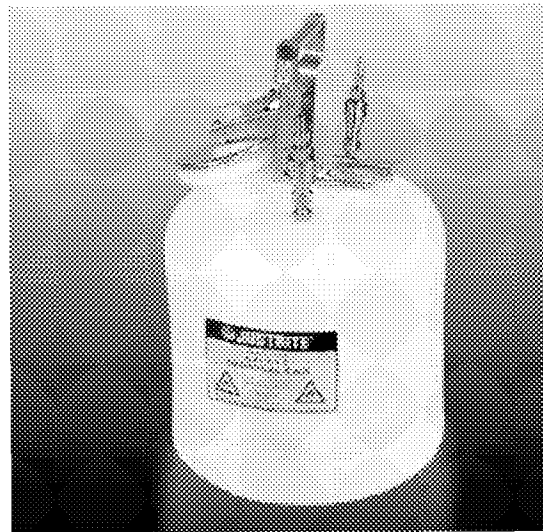


**Request a hazardous waste pick-up
<http://www.umass.cems.sr.unh.edu/CEMS/RequestRemoval>**

EH&S Safety Containers

Safety containers are provided for those halogenated and non halogenated solvents destined for comingling

Waste can be collected in any tight closing compatible container. We supply these 20 Liter Safety Cans



Low volume Generators can use smaller Containers.

We prefer clear containers in order to easily view layers or contaminants in the waste profile

Separate Halogenated from Non- Halogenated Organic Solvents

This waste must NOT Contain

Concentrated amines

Strong Corrosives < 3 and > 10

Alkali Metals

Heavy Metals

Sulfur or phosphor compounds

**Any questions about mixing chemicals in a waste container,
call EHS 413.545.2682**

Types of Waste – Sharps, Solid Waste

Sharps

- All needles, syringes, razor blades
- Dispose in sharps containers – available in the Fisher stockroom



Silicon Wafers, silica gel, Non Hazardous type waste --

- Dispose in thick walled, plastic container with a cover or in heavy plastic bags. Double bag waste and label contents
- List hazards on label



Request a hazardous waste pick-up

<http://www.umass.cems.sr.unh.edu/CEMS/RequestRemoval>

Types of Solid Waste

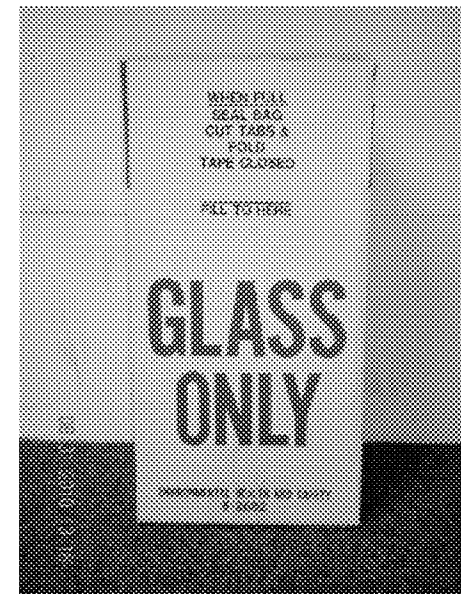
Solid Waste: Landfill

- No liquid waste, recently cited for 150 gallons of maple syrup
- Perception of doing something wrong



Solid Waste: Incinerator

- Non Hazardous Waste should not have a hazardous waste label
- Empty laboratory glassware, empty bottles should go into glass only box
- Should have plastic liner and do not overfill



Request a hazardous waste pick-up

<http://www.umass.cems.sr.unh.edu/CEMS/RequestRemoval>

Types of Hazardous Waste Nanomaterials

- ❑ DO NOT put nanomaterial - bearing waste streams into the regular trash or down the drain**
- ❑ Collect all nanoparticles and any contaminated material such as wipes, PPE, filters, spill clean-up material**
- ❑ Package nanomaterial-bearing wastes in containers that are compatible with the contents, in good condition, and that afford adequate containment to prevent the escape of the material**

Call EHS at 545-2682 with nano waste questions

Waste considerations

- ❑ **Safety**

- ❑ **Accurate information on waste contents must be submitted in order to make reasonable decisions on what containers to bulk**
- ❑ **We have experienced some exothermic reactions due to either a lack of, or an improper description of contents**

- ❑ **Costs \$**

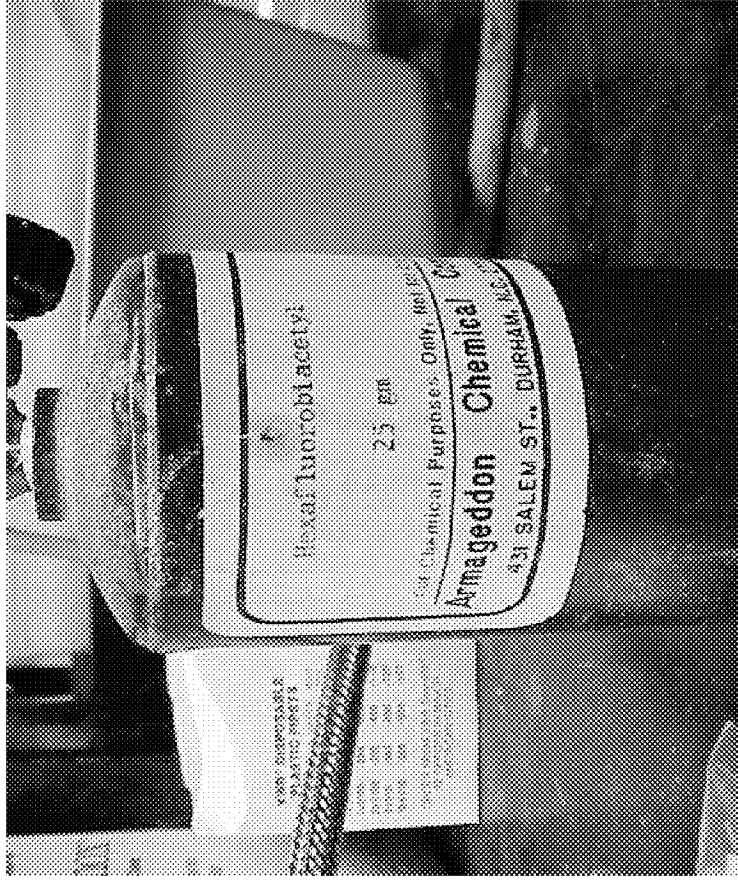
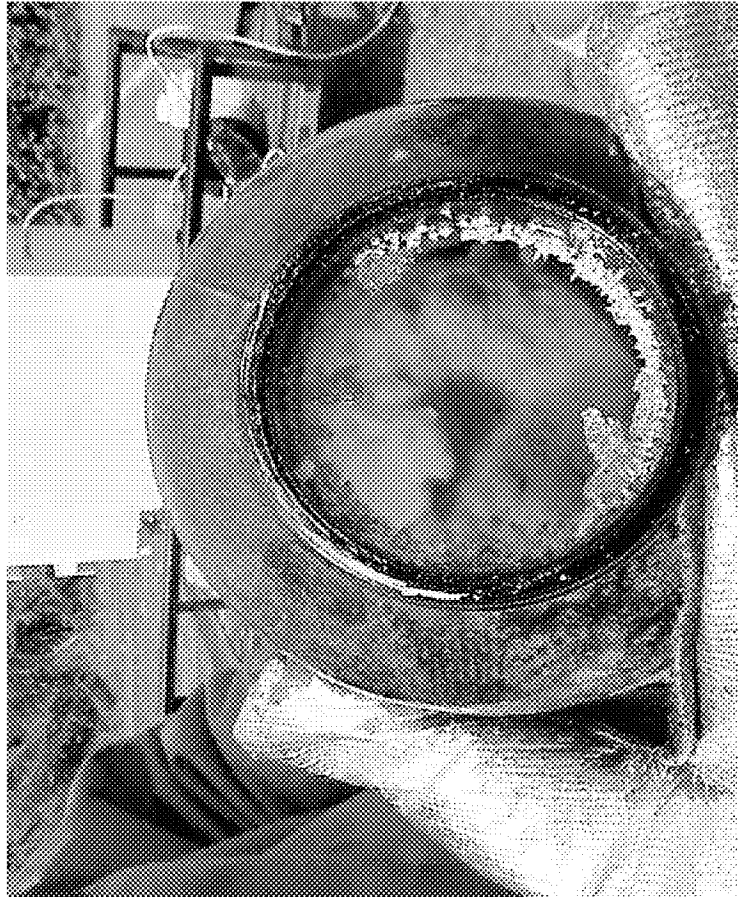
- ❑ **If waste is compatible and co-mingled, the university can realize significant savings**

Hazardous Waste

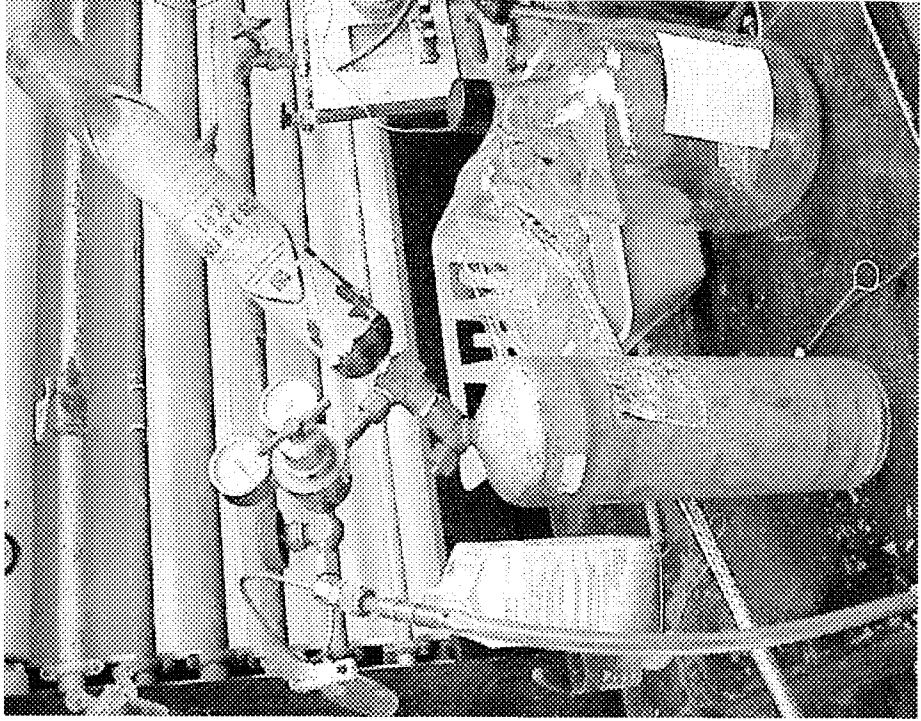
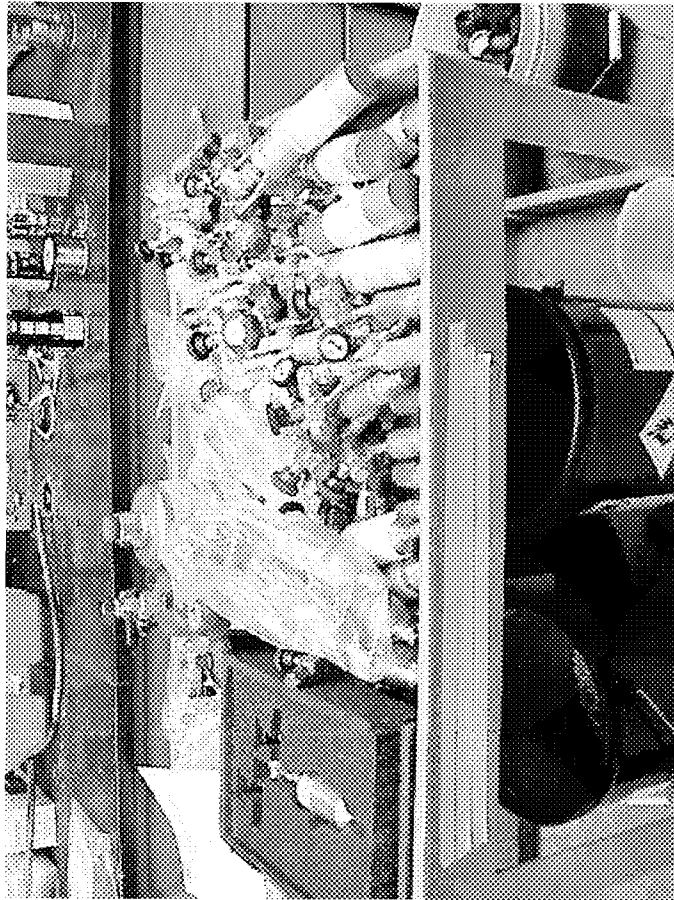
High Cost Items Laboratory samples, Unknowns



Dispose of your hazardous waste before it becomes dangerous



Manage Your Hazardous Waste



Questions?